

Notice of Allowability

Application No.

10/724,448

Examiner

Abolfazi Tabatabai

Applicant(s)

SEMENOV ET AL.

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to application filed on November 26, 2003.
2. ☒ The allowed claim(s) is/are 1-63.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 5/3/2004
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____

Information Disclosure Statement

1. **Information Disclosure Statement (IDS) submitted on May 3, 2004, are considered by the Examiner.**

Drawings

2. **The drawings were received on November 26, 2003. The Examiner accepts these drawings.**

Reasons for Allowance

3. The following is an Examiner's statement of reasons for allowance.

The prior art of record fails to teach or suggest, comprises system and method for non-destructive functional imaging and mapping of electrical excitation of biological tissue using electromagnetic field tomography and spectroscopy comprises measuring interference characteristics of an electromagnetic field caused by an electrical /dielectrical object and by an electromagnetic field generated by the biological object; determining an image of the biological object and the spread of electrical excitation in the biological object by inverting the electromagnetic fields detected by the plurality of electromagnetic field detectors and displaying at least one image representative of the spread of electrical excitation in the biological tissue in combination into other features and elements of claims 1, 29, 51 and 56; (b) executing a calibration procedure which permits detected electromagnetic fields to be compared with electromagnetic fields measured in the absence of a biological object, the

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procedure including selecting a electromagnetic fields source and a plurality of electromagnetic fields detectors used in the procedure and calculating the calibration signals for both measured and calculated data sets and division both sets of data on consequent calibrated constants; calculating a gradient of a functional in order to calculate one step of an iterative procedure, the calculating step including the sub steps of: modeling an incident field for each source and detector of electromagnetic fields, solving a direct problem for each source of electromagnetic fields, calculating a back wave on the bounds of computational domain for each source of electromagnetic fields, and calculating a back wave inside the computational domain, wherein the gradient of the functional calculation by combining the direct and back waves for all sources of the electromagnetic fields; iteratively calculating the absolute value of the functional divided by the absolute value of the gradient and multiplied by an empiric constant to produce the iterative step for the calculation of the changing dielectric properties; and accepting or declining the current step changing the dielectric properties depending on the functional, wherein: if the functional decreases during the current step, accepting the current step changing the dielectric properties; and if the functional does not decrease during the current step, declining the current step changing the dielectric properties wherein the iterative procedure is successful if the functional achieved the threshold value which corresponds with measuring noise level and statistics and is unsuccessful if the functional does not achieve the threshold after a predetermined number of iterations in combination into other features and elements of claim 61; (c) imaging the biological object using a direct problem solver that serves to

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solve Maxwell's equations in parallel with the nonreflecting boundary conditions, the direct problem solver including: calculating a source function that is the physical source of electromagnetic fields modeling and calculating its value on a computational mesh; determining numerical values of the three-dimensional (3D) Green's function calculations; performing a direct 3D discrete sine Fourier transform on the source function; performing a boundary conditions correction that introduces real nonreflecting boundary conditions instead of zero value boundary conditions which appear as a results of the sine Fourier transform application; applying the 3D Fourier image of the Green's function to the solution which gives the problem solving in the discrete Fourier space; and performing the 3D inverse sine Fourier transform which solves the problem in the real physical space in combination into other features and elements of claim 62;

(d) imaging the biological object using a computational process that includes a back wave calculation procedure for solving Maxwell's equations for the waves propagating from the area of plurality of electromagnetic field detectors of and having an amplitude corresponding to the difference between the values in the presence and the absence of the biological object, the computational process including: the fast procedure of waves propagating through the free space starting in the detectors area and finishing on the computational domain bounds; the fast procedure of waves propagating through free space with boundary conditions of the first order using the sine type fast Fourier transform; and the fast procedure of waves propagating through inhomogeneous matter with unreflecting boundary conditions utilizing a direct problem solver in combination into other features and elements of claim 63.

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6. **Claims 1-63 are allowed.**

Citation of Relevant Prior Art

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Gregory (U. S. 6,522,910 B1) discloses electrical property enhanced tomography apparatus and method.

Duensing et al (U. S. 6,856,494 B1) disclose method and apparatus for noise tomography.

Svenson et al (U. S. 6,026,173) disclose electrical imaging and therapeutic systems.

Svenson et al (U. S. 5,715,819) disclose microwave tomographic spectroscopy system and method.

Contact Information

8. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to ABOLFAZL TABATABAI whose telephone number is (571) 272-7458.

The Examiner can normally be reached on Monday through Friday from 9:30 a.m. to 7:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Mehta Bhavesh M, can be reached at (571) 272-7453. The fax phone number for organization where this application or proceeding is assigned is (571) 273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

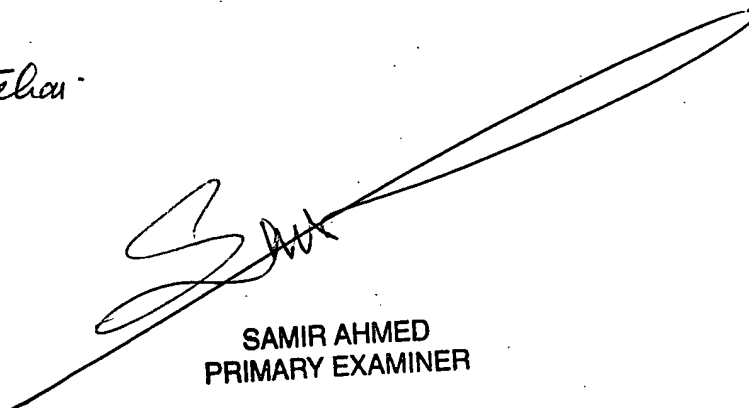
Abolfazl Tabatabai

Patent Examiner

Technology Division 2624

February 2, 2007

A-Tabatabai



SAMIR AHMED
PRIMARY EXAMINER